

ENGINEERING EDUCATION - DOCTOR OF PHILOSOPHY (PHD)

The Engineering Education (ENED) doctoral program is designed for students with a background in engineering and an interest in improving the education of engineers. Our vision of engineering education goes beyond curriculum design and pedagogy to include attracting and graduating diverse students with a well-rounded education and a desire to improve society and the environment. ENED graduates will be prepared to conduct research to study significant problems in engineering education, apply research-based instructional strategies in engineering courses, and understand policy implications for student success. The flexible and cross-disciplinary Engineering Education PhD program is designed to allow students to tailor their curriculum and research and to prepare them to achieve their goals in engineering education.

The PhD program is open to first-time graduate students as well as those who hold master's degrees.

For more information, visit the Engineering Education PhD Program (<https://www.colorado.edu/program/ide/phd-engineering-education/>) page.

Requirements

Required Courses and Credits

All Engineering Education PhD students must complete a minimum of 30 credit hours of coursework at the 5000 level or higher, plus 30 credit hours of dissertation credits. Some research advisors will require that their students complete more than 30 course credits, and the department recommends that specific course decisions should be agreed upon through individual faculty/student discussions. Students must receive a minimum grade of B- (2.7) in each class to count towards the degree. Students must also maintain a cumulative GPA of 3.0 or higher to be in good standing with the graduate school.

Code	Title	Credit Hours
Required Courses ¹		
	Engineering or computer science technical courses	9
	Designated engineering education related courses. Approved courses include but are not limited to ENED and EDUC. ²	12
	Additional relevant credit hours from engineering, education, or other fields (e.g., business, sociology, psychology)	9
Total Credit Hours		30

¹ Up to 21 credit hours of graduate-level coursework may be transferred or applied to meet the 30-credit hour course requirement for the PhD. Courses transferred or applied must be relevant to the PhD degree, and their acceptance is at the discretion of the program faculty and the Graduate School.

² See table below for list of approved graduate-level engineering cognate area and education courses.

Engineering Cognate Area and Education Courses

Code	Title	Credit Hours
Engineering Cognate Area		
	Graduate-level engineering courses at the 5000-level or higher; from departments and programs hosted in CEAS, including AREN, ASEN, BMEN, CHEN, CVEN, CSCI, ECEN, EEEN, EMEN, EVEN and MCEN.	9
Education Courses		
	Graduate-level courses related to engineering education research and teaching at the 5000-level or higher; from EDEN, EDUC, INFO, PHYS, PSYC, SOCY, etc. For example:	12
EDUC 5445	Curriculum for Multicultural Education	
EDUC 5835	Teaching K-12 Mathematics: Geometry & Measurement	
EDUC 5844	Teaching and Learning Computational Thinking	
EDUC 6210	Education Policy and the Law	
EDUC 6220	Gender Issues in Education	
EDUC 6240	African American Education in the United States	
EDUC 6245	Latinx Education Across the Americas	
EDUC 6250	Higher Education in the United States	
EDUC 6318	Psychological Foundations of Education	
EDUC 6405	College Student Development and Counseling Theories	
EDUC 6504/ PSYC 6200	Issues and Methods in Cognitive Science	
EDUC 6705	Leadership in Higher Education	
EDUC 6928	Readings in Learning Sciences and Human Development	
EDUC 7326	Quasi-Experimental Design in Causal Inference in Social Sciences	
EDUC 7376	Theory and Practice of Educational and Psychological Measurement	
EDUC 7386	Educational Evaluation	
EDUC 7446	Policy Issues in Education	
EDUC 8025	Seminar: Curriculum Theories	
EDUC 8348	Human Development in Cultural, Historical, and Sociopolitical Contexts	
EDUC 8358	Critical Introduction to Learning Theory and Practice, Part 1	
EDUC 8710	Measurement in Survey Research	
ENED 5100	Foundations of Engineering Education 1	
ENED 5200	Foundations of Engineering Education 2	
ENED 5400	Teaching Design	
ENED 6599	Special Topics in Engineering Education	
ENED 6999	Graduate Seminar in Engineering Education	
ENED 7900	Independent Study	
ENED 8999	Doctoral Dissertation	
INFO 5602	Information Visualization	
PHYS 5460	Teaching and Learning Physics	
PSYC 5145	Advanced Cognitive Psychology	
PSYC 5835	Thinking Proseminar	

SOCY 5031	Research Design	
SOCY 5111	Statistics 1: Introduction to Social Statistics	
SOCY 5181	Logics of Qualitative Inquiry	
SOCY 6111	Stats 2: Statistic Analysis	
SOCY 6121	Qualitative Methods	
SOCY 7111	Data III–Advanced Data Analysis	
SOCY 7121	Qualitative Analysis	
STAT 5000	Statistical Methods and Application I	
STAT 5010	Statistical Methods and Applications II	
Additional Coursework		
The remaining credit hours can be related to either the engineering cognate area or education courses as described above as befits the individual student, with the approval of their faculty advisor and dissertation committee.		9
Total Credit Hours		30

- Design and conduct high-quality and original research in the discipline of engineering education and/or computer science education
- Effectively communicate research to academic audiences in both written and oral form.

Preliminary Examination

Satisfactory completion of a preliminary examination. Engineering Education PhD students are required to pass a preliminary examination that will include written and/or oral components, per the discretion of a group of 3 or more faculty affiliated with the ENED program in consultation with the student. This is typically completed within the first three semesters after matriculation into the program.

Comprehensive Examination

Satisfactory completion of a comprehensive examination to defend the PhD thesis proposal. The Comprehensive Examination is an important second evaluation step required to advance the student to candidacy for the PhD degree. It is typically completed within the first three years after matriculation to the program and more than one year prior to graduation. It consists of a written research proposal in addition to an oral exam with a selected committee of faculty advisors, both focusing on the proposed course of research.

PhD Dissertation

Satisfactory completion of a minimum of 30 semester hours of dissertation credits. Satisfactory completion and defense of a PhD dissertation under the supervision of a research advisor who is a CU Boulder faculty member affiliated with the ENED program. The dissertation must fulfill all Graduate School requirements. After the dissertation is completed, an oral final examination on the dissertation and related topics is conducted by the student's doctoral committee.

Time Limit

All degree requirements for the Engineering Education PhD must be completed within six years of the date commencing coursework.

Learning Outcomes

By the completion of the program, students will be able to:

- Demonstrate expertise of knowledge in engineering education and/or computer science education
- Demonstrate the ability to synthesize information and formulate conclusions and recommendations related to engineering education and/or computer science education through academic writing